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ABSTRACT

This document describes how mature scientists who received their master's or bachelor's degrees between two and fifteen years ago, and who are unemployed, underemployed, or need refresher work, are taking tuition-free courses. The year-long program includes courses in chemical concepts, physical chemistry, food and flavor chemistry, environmental science, industrial toxicology, mathematics for chemists, research, and technical writing. Participants who complete the program are given a certificate of completion and placement assistance for either employment or graduate school. Students were contacted by an intensive advertising campaign which included media talk shows, public service announcements, advertisements in newspapers and in C & E News, mailed brochures to women alumni, posters in public places such as libraries, and personal contact with local industries and local service organizations. Newspaper advertisements were the most productive form of recruitment for mature women students. Selection was based on transcripts, volunteer activities over the last fifteen years, and current vocational interest. (Author/BE)

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A CONTINUING EDUCATION PROGRAM FOR THE MATURE WOMAN TRAINED IN A SCIENCE[2]: I. THE PROGRAM

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A forty-five credit tuition-free Science Career Facilitation Project is an experimental Continuing Education Program for mature women scientists. The year-long (1977-1978) project is supported by the National Science Foundation for women who received bachelor's or master's degrees in science between two and fifteen years ago and who are not now employed in the fields for which they were trained. These women are provided special courses in chemistry, physical chemistry, food chemistry, technical writing, environmental science, and mathematics for chemists. These courses are designed to increase their level of knowledge to that expected of a current graduate. At the end of their training, the women are to be assisted in their plans to find employment as chemists, biologists, food chemists, or environmental chemists or to pursue graduate studies.

The purposes of this paper are (a) to relate the scope of Career Facilitation Projects, (b) to delineate some of the data on the current status of women in the sciences locally, regionally, and nationally, (c) to describe the methods used in the recruitment and selection of Career Facilitation Project participants, (d) to give a composite picture of the women in the local program at Southern Illinois University at Edwardsville (SIUE), and (e) to present highlights of the local educational program which was designed to update and refresh the scientific skills of Women in Science participants.

SCOPE OF CAREER FACILITATION PROJECTS

The Science Career Facilitation program at Southern Illinois University at Edwardsville is one of ten such projects funded nationally by the National Science Foundation for the 1977-1978 academic year. Table 1 lists the location of Career Facilitation Projects, the project directors, the scientific disciplines represented and the level of funding of each project (1). The Career Facilitation Projects provide training to women in a broad area of sciences

TABLE 1. SCIENCE CAREER FACILITATION PROJECTS FUNDED BY NSF[1]

STATE/ INSTITUTION	PROJECT DIRECTOR/ DEPARTMENT	FIELD	NO. OF PARTICIPANTS	AWARD AMOUNT
CALIFORNIA				
CAL. ST. UNIVERSITY NORTHRIDGE 91324	BONITA J. CAMPBELL ENGR. AND COMPUTER SCIENCE	EN	35	$ 93,670
**MOUNT ST. MARY'S COLL. LOS ANGELES 90049	SISTER ANNETTE BOWER BIOLOGICAL SCIENCES	BC PH	20	50,360
ILLINOIS				
SOUTHERN ILLINOIS UNIV. EDWARDSVILLE 62025	CHARLOTTE O. LEE CHEMISTRY	CH	24	69,990
MASSACHUSETTS				
**MOUNT HOLYOKE COLL. SOUTH HADLEY 01075	EDWIN S. WEAVER CHEMISTRY	CH	40	14,400
MISSISSIPPI				
*ALCORN STATE UNIV. LORMAN 39096	RUTH M. BRADY CHEMISTRY AND PHYSICS	IN	20	32,670
NEW YORK				
CUNY GRADUATE SCHOOL NEW YORK 10036	DEANNA CHITAYAT CTR. FOR ADVANCER STUDY IN EDUC.	CO	45	116,330
STATE UNIVERSITY OF N.Y. STONY BROOK 11790	PATRICK J. HERLEY MATERIALS SCIENCE	EN	20	52,980
PENNSYLVANIA				
**CHATHAM COLLEGE PITTSBURGH 15232	DIANE K. WAKEFIELD CHEMISTRY	CH	20	61,840
TEXAS				
UNIVERSITY OF HOUSTON HOUSTON 77004	GERHARD F. PASKUSZ ELECTRICAL ENGINEERING	EN	30	86,070
UNIVERSITY OF TEXAS ARLING 76010	ANN BENHAM CHEMISTRY	IN	35	100,000

DISCIPLINE CODES

BC BIOCHEMISTRY
CH CHEMISTRY
CO COMPUTER SCIENCE
EN ENGINEERING
IN INTERDISCIPLINARY SCIENCE
PH PHYSIOLOGY

* MINORITY INSTITUTION
** WOMEN'S COLLEGE

such as engineering, chemistry, life sciences, computer sciences, industrial chemistry, food chemistry, environmental sciences, and systems analysis.

The scope and specific objectives of the local project was determined after an examination of data collected on the status of women in science from local, regional, and national sources. These data will be presented in the section on the status of Women in Science. The specific objectives of the local Career Facilitation Project are presented in Table 2. The program is housed in the Department of Chemistry, therefore, its focus is primarily chemical. We are re-training biologists, mathematicians, and general scientists to re-enter interrupted careers. Pre-tests were used to ascertain the current skills level of each woman. A post-test will be used for evaluation at the program's end. The women participants who are matriculated at the university as unclassified students in the graduate school may or may not take all courses for transcript credits. They will be given Certificates of Completion when the project is completed. Women who complete the program and wish job or graduate school placement assistance will have at their disposal the resources of the university and of the Women in Science Faculty and Staff. Counseling and tutorial services are available throughout the program.

STATUS OF WOMEN IN SCIENCE

For the purpose of this statement the word science will refer primarily to chemistry.

Table 3 shows the representation of women in the science faculty of Southern Illinois University at Edwardsville compared to values for colleges and universities nationally (2). The Department of Biological Sciences has a higher percentage of women science faculty members than either chemistry or mathematics, however, the overall representation of women on the science faculty at

TABLE 2. OBJECTIVES OF THE WOMEN IN SCIENCE CAREER FACILITATION PROJECT

1. TO RETRAIN B.S. OR M.S. CHEMISTS, BIOLOGISTS OR GENERAL SCIENTISTS TO RE-ENTER INTERRUPTED CAREERS.

2. TO ASCERTAIN BY MEANS OF PRE-TEST THE CURRENT SKILLS LEVELS OF EACH WOMAN.

3. TO ASSIST WOMEN TO ENTER CLOSELY RELATED CAREER FIELDS.

4. TO ASSIST WOMEN TO ENTER THE JOB MARKET IMMEDIATELY OR TO GO DIRECTLY TO GRADUATE SCHOOL.

5. TO PROVIDE COUNSELING AND TUTORIAL SERVICES TO WOMEN WHICH WILL EASE THE TRANSITION INTO THE ACADEMIC ENVIRONMENT.

SIUE is below the national averages in all categories. These values have not changed since 1975 and they are in agreement with the AAAS report (12) which states "Over a period of the last ten years the number of women in scientific areas has just not moved off the bottom line". The Green, Roscher (11) report entitled "Women's Toehold on Chemistry Faculties Still Just That" states that women still are only 1.5% of the larger chemistry faculties of schools that grant graduate degrees. Green and Roscher stated that "although ten percent of new Ph.D. chemists are women, low percentages will remain so for the foreseeable future due to tenure and the decline in the size of faculties at many chemistry departments" (11).

The percentage of women science graduates from the School of Science and Technology are presented in Table 4. Here the percentage of women graduates from the Department of Biological Studies agrees closely with the national percentage of women on life science faculties (7). Actually, this SIUE department has greater than fifty percent of the women science graduates in the school. The number of chemistry graduates, as well as women chemistry graduates, is low in the School of Science and Technology and the percentage of women chemistry graduates varies from a low in 1975 of 3.3 percent to 13.1 percent in 1976.

The data presented in Table 5 is not very impressive, however, the high number of no data available entries for graduates from the Department of Biological Sciences may reflect no results to report or a lack of employment in the area in which they were trained.

Because the University has not always kept data on the ethnic characteristics of its graduates, it is not possible to ascertain the proportion of minority women represented by the statistics presented in Tables 4 and 5. However, if job hiring patterns represent the kinds of employee pool available

TABLE 3. SIUE FACULTY IN THE SCIENCES VS. NATIONAL VALUES FOR COLLEGES AND UNIVERSITIES 1975,1976

DEPARTMENT	FULL-TIME TOTAL FACULTY		NUMBER OF WOMEN		PERCENT	NATIONAL PERCENT [2]
	1975	1976	1975	1976		1975
SCHOOL OF DENTAL MEDICINE	93	93	7	7	7.5	NO DATA
SCIENCE AND TECHNOLOGY						
BIOLOGICAL SCIENCES	19	19	3	3	15.7	53
CHEMISTRY	15	15	1	1	6.6	10.3
ENGINEERING TECHNOLOGY	13	13	0	0	0	NO DATA
MATHEMATICAL STUDIES	27	27	3	3	11.1	-
PHYSICS	15	15	0	0	0	-
SCHOOL OF SCIENCE & TECHNOLOGY	1	1	0	0	0	-
TOTAL FACULTY - S & T	90	90	7	7	7.7	

[2] ACS REPORT, C & E N, NOVEMBER 8, 1976, P. 27 (2).

TABLE 4. WOMEN GRADUATES FROM THE SCHOOL OF SCIENCE AND TECHNOLOGY AT SOUTHERN ILLINOIS UNIVERSITY AT EDWARDSVILLE FOR 1975 AND 1976 [1]

DEPARTMENT	(1) TOTAL GRADUATES 1975	1976	(2) PERCENT OF S&T [A] 1975	1976	(3) NUMBER OF WOMEN 1975	1976	(4) PERCENT OF WOMEN 1975	1976	(5) PERCENT OF S&T WOMEN 1975	1976
CHEMISTRY										
AB/BA	22	17	9.2	10.6	2	5	9.1	29.4	3.3	13.1
MS/MA	6	13	15.7	35.1	1	2	16.6	15.4	7.6	16.6
BIOLOGICAL SCIENCES										
BS/BA	100	74	42	46.3	39	28	39	37.8	66.1	76.3
MS/MA	10	9	26	24.3	6	5	60	55.5	46.1	41.6
SCHOOL OF SCIENCE AND TECHNOLOGY										
BS/AB BA	238	160			59	38	24.7	23.7		
MA/MS	38	37			13	12	35.1	32.4		

[1] COMPILED FROM COMMENCEMENT BULLETINS OF SIUE 1975 AND 1976 (3)

[A] S & T - SCHOOL OF SCIENCT AND TECHNOLOGY

TABLE 5. TYPE OF EMPLOYMENT: WOMEN GRADUATES FROM THE SCHOOL OF SCIENCE AND TECHNOLOGY BY DEPARTMENTS - 1975-1976 [1]

DEPARTMENTS	1975 EMPLOYMENT [2]	1976
BIOLOGICAL SCIENCES		
BS/BA/AB	2 GRADUATE STUDIES AT SIUE 20 NO DATA AVAILABLE 1 RESEARCH ASSISTANT 5 MEDICAL TECHNOLOGIST	4 GRADUATE STUDIES AT SIUE 28 NO DATA AVAILABLE 1 JUNIOR HIGH TEACHER 1 RECEPTIONIST AND PHYSICIAN'S ASSISTANT
MS/MA	1 NO DATA 1 RESEARCH ASSISTANT 1 PH.D. CANDIDATE	3 NO DATA
CHEMISTRY		
BS/BA/AB	1 GRADUATE STUDIES AT SIUE 1 CHEMIST	1 LABORATORY TECHNICIAN 1 ANALYTICAL CHEMIST 2 NO DATA 1 PLACED, NO DATA ON POSITION
MS/MA	1 PRODUCT ENGINEER	2 NO DATA AVAILABLE

[1] INFORMATION FROM THE SIUE PLACEMENT SERVICES OFFICE (4).

[2] EMPLOYMENT INFORMATION IS BASED ON PLACEMENT IN THE ST. LOUIS METROPOLITAN AREA.

TABLE 6. CURRENT EMPLOYMENT AND EMPLOYMENT PROJECTIONS FOR FOOD CHEMISTS IN THE METROPOLITAN AREA [1]

CATEGORY	EDUCATION			NUMBER OF FULL-TIME EMPLOYEES	
					ESTIMATED ADDITIONAL EMPLOYEES
	H.S.	B.S./A.B.	GRAD.	1976	1982
1. CHEMISTRY	1	46+	10+	60	47
2. MARKETING	20	62	-	88	75
3. PRODUCTION	97	20	-	110	83
4. QUALITY CONTROL	35	41	-	41	59
5. RESEARCH	5	68	31	47	45
6. BUSINESS	5	47	-	49	39
7. MANAGEMENT	25	56	31	72	62
8. EDUCATION	-	5	-	6	6
9. OTHER	15	10	-	17	14
10. TOTALS	203+	355	72	490	430

[1] DEPARTMENT OF CHEMISTRY - SIUE SURVEY DATA, 1976 (5).

TABLE 7. PERCENTAGE OF EMPLOYEES IN FOOD CHEMISTRY CATEGORIES WHO WOULD BENEFIT FROM TRAINING IN FOOD CHEMISTRY IN THE METROPOLITAN SAINT LOUIS AREA

CATEGORIES	TOTAL PERCENTAGES OF REPORTING FIRMS
CHEMISTRY	30
PRODUCTION	35
QUALITY CONTROL	51
EDUCATION	10
MARKETING	32
APPLIED RESEARCH	52
BASIC RESEARCH	41
BUSINESS	47
MANAGEMENT	73
OTHERS	11

[1]DEPARTMENT OF CHEMISTRY, SOUTHERN ILLINOIS UNIVERSITY AT EDWARDSVILLE, SURVEY DATA, 1976.

TABLE 11. PROFILE OF WOMEN IN SCIENCE

II. CURRENT OCCUPATIONS OF WOMEN IN SCIENCE PARTICIPANTS, FALL, 1977

OCCUPATION	FREQUENCY
HOMEMAKER/HOUSEWIFE	9
GRADUATE STUDENT	2
*CHEMIST	1
INSTRUCTOR (PART-TIME)	1
BOOKKEEPER (PART-TIME)	1
RETAIL SALES PERSON (PART-TIME)	1
SUBSTITUTE TEACHER	1
UNEMPLOYED	1
RADIOLOGIST (PART-TIME)	1
*CHAIRMAN, SCIENCE DEPARTMENT OF A HIGH SCHOOL	1
SOCIAL WORKER	1
TOTAL	20

*INTEREST IN FOOD CHEMISTRY AS A PART-TIME PARTICIPANT, ONLY

to potential employers, data is available which shows that the percentage of minority women employed in industrial chemical positions in the State of Illinois and in Chicago varied from a low value of 0.3 percent to a high of 4.7 percentage (8). Clearly the number of minority females represented in the industrial chemical environment is less than five percent of the work force; the values are even lower for the State of Missouri and the City of St. Louis. The employment picture of minority women Life Scientists is better than that for minority female chemists. The representation of minority female biologists in the Medical and other Health Services varies from a high of 31.6 percent to a low of 6.2 percent in Missouri and from 26.8 to 8.4 percent in Illinois (8).

In July 1976, an employment survey was conducted by the Department of Chemistry of twenty-two major food and beverage processing firms in the St. Louis Metropolitan Area. Table 6 and 7 summarize the employment projections for food chemists and the current employees working in food chemistry categories who could benefit from training in food chemistry (5). A local need for more trained food chemists is verified. A local consultant in environmental science has revealed that chemists are hired and trained on the job as environmental technicians in local factories (10). There are almost no industrial hygienists in the St. Louis Metropolitan Area. Trained industrial hygienists are usually based in other cities and provide professional services to local refineries and to chemical companies by commuting into this area (10).

Information published by the United States Department of Labor (USDL) in the Occupational Outlook in Brief, 1976-1977 and Occupational Handbook 1975, 1976 projects generally good prospects through 1985 for employment in chemistry, biology (life science), food science, and environmental science. A summary of these data is presented in Table 8. If current employment patterns hold, there

TABLE 8. WOMEN SCIENTISTS EMPLOYED NATIONALLY AND AN ESTIMATE FOR EMPLOYMENT PROJECTIONS THROUGH 1985 [1,2]

CATEGORIES	TOTAL EMPLOYMENT 1974	PERCENT WOMEN	ANNUAL OPENINGS 1974 - 1985	ESTIMATED ANNUAL NEED FOR WOMEN
BIOLOGICAL SCIENCES	190,000	33	10,700	3,531
BIOCHEMISTS	12,500	-	800	-
FOOD SCIENTISTS	7,500	15	350	53
CHEMISTS	135,000	10	6,400	640
OCCUPATIONAL, SAFETY AND HEALTH WORKERS	25,000	-	1,100	-
ENVIRONMENTAL SCIENTISTS				
GEOLOGISTS	24,000	-	-	-
GEOPHYSICISTS	8,000	-	-	-
METEOROLOGISTS	5,000	10	-	-
OCEANOGRAPHERS	4,500	3	-	-

1 U.S. DEPARTMENT OF LABOR, "OCCUPATIONAL OUTLOOK HANDBOOK IN BRIEF, 1976-1977," PP. 12-19, 1976.

2 _____ "OCCUPATIONAL OUTLOOK HANDBOOK", 1975; 1976, P. 339 FF.

will be an estimated annual need of only 640 women chemists while the openings for men will be 6400, Only fifty-three women food chemists can expect employment if current trends continue.

RECRUITMENT AND SELECTION OF PARTICIPANTS

Women were recruited by means of an intensive advertisement campaign, including radio talk shows and radio public service announcements, printed posters, advertisements in Chemical and Engineering News, brochures, and display advertisements in local newspapers.

Figure 1 is a replica of the poster used to advertise the program. Posters were placed in shopping centers, physician offices, libraries, restaurants, laundro-mats, and community centers. Figure 2 is a newspaper display advertisement. Because display advertisements are very expensive, the ads were placed only during the period of prospective peak readership. For example, ads were placed in the Everyday Section of the local Sunday newspaper with estimated readership of 400,000 readers on week-ends. A summary of the sources of recruitment is listed in Table 9.

Approximately fifty percent of the selected participants learned of the program from the display advertisements. Initial contact was established with other participants through classified advertisements. Many inquiries were obtained from persons who heard the radio shows and the public service announcements about the Career Facilitation Project. However, no participants were selected from these sources.

The selection process included a review of applications and transcripts by faculty and staff members. The basis for selection of participants was the nature of educational and volunteer activities since the terminal degree was obtained, personal or telephone interviews, and in some cases, an apparent

TABLE 9. RECRUITMENT AND SELECTION OF PARTICIPANTS

	NEWS SOURCE	PARTICIPANTS SELECTED	COMMENTS
1.	ST. LOUIS POST-DISPATCH	4	DISPLAY ADS
	A. ENTERTAINMENT SECTION	1	DISPLAY ADS
	B. SUNDAY PAPER	3	DISPLAY ADS
2.	ST. LOUIS GLOBE DEMOCRAT	1	CLASSIFIED ADS
3.	EDWARDSVILLE JOURNAL	1	CLASSIFIED ADS
4.	EDWARDSVILLE INTELLIGENCER	1	CLASSIFIED ADS
5.	COLLINSVILLE HERALD	1	CLASSIFIED ADS
6.	BELLEVILLE NEWS DEMOCRAT ("HUSBAND READ ADVERTISEMENT IN NEWSPAPER, I BELIEVE")	1	CLASSIFIED ADS
7.	MAILING LIST OF BROCHURES	2	SIUE ALUMNI OFFICE
8.	POSTER (RUSTY'S RESTAURANT IN EDWARDSVILLE)	1	
9.	POSTER	1	
	TOTAL	17	

Figure 2

6I June 19, 1977 ST. LOUIS POST-DISPATCH

WOMEN IN SCIENCE

Tuition FREE Courses at SIUE

Tuition FREE Courses are offered as part of Southern Illinois University's Mid-Career Program for the Mature Woman Scientist. The program, sponsored by the National Science Foundation, offers courses to women holding at least a Bachelor's Degree in Science. Courses in chemistry, physical chemistry, environmental science, food chemistry, mathematics for chemists, and technical writing will be available from September 26, 1977 to June 15, 1978. Application deadline is July 15, 1977.

More information may be obtained by calling (618) 692-2042 or writing Dr. Charlotte O. Lee, Box 65, Department of Chemistry, SIUE, Edwardsville, Illinois 62026 or listening to WSIE-FM 88.7 "Looking Glass" June 22 or 26, 7:00 p.m.

Figure 1

WOMEN SCIENTISTS

tuition-free courses

qualifications required: For women who received a Bachelor's or Master's Degree in science between 1960 and 1975.

courses offered: If you are a woman between CAREERS and would like to take additional COURSES IN:

Basic Chemical Concepts	Flavor Chemistry
Physical Chemistry	Food Chemistry and Analysis
Environmental Sciences	Mathematics for Chemists
Industrial Toxicology	Technical Writing

benefits: This Program will provide 45 credit hours of courses at **no cost to you.**

maximum enrollments: Participation is limited to 24 mid-career women scientists.

term of contract: Beginning September 26, 1977 -- June 15, 1978

deadline: Apply for admission to the National Science Foundation sponsored Women in Science Career Facilitation Program at Southern Illinois University **BEFORE JULY 15, 1977.**

closing date for applications: JULY 15, 1977

. . . To Apply:

To receive an Application Form, please detach one of the attached cards and . . .

mail to: ➡

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Charlotte O. Lee, Ph.D.
Associate Professor of Chemistry
Box 65
Southern Illinois University at Edwardsville
Edwardsville, Illinois 62025

SIU SOUTHERN ILLINOIS UNIVERSITY AT EDWARDSVILLE

interest in the resumption of an interrupted career as determined by the "Self-Directed Search" by Holland (14). Women who were outside the limits of eligibility were considered on an individual basis, for example, one participant graduated in 1977, however, she was a mature student in her very late thirties who had just finished her undergraduate degree. Another woman received her Master's degree in 1952 from Radcliffe College and was considered a good risk.

PROFILE OF WOMEN IN SCIENCE

More biologists than chemists are participating in a Science Career Facilitation Project operated by the Department of Chemistry at Southern Illinois University at Edwardsville. The college majors and minors of Women in Science Participants are listed in Table 10. The predominant major was biology and the minor was chemistry. A mathematician, psychologist, pharmacist, medical technologist, home economist, comprehensive scientist, animal scientist and microbiologist are also effective participants. Table 11 shows that some of the women were employed on a part-time basis in retail sales, in radiology, in social work, and in other fields. The majority of the women were employed as homemakers/housewives. A variety of reasons were given by the women for career inactivity. Some of those reasons such as "not qualified to coach athletics", "got married", "fear of having forgotten most of what I knew",as well as other reasons are presented in profile III in Table 12.

Although the Career Facilitation Project is a tuition-free academic program, it does not carry any stipends to the participants themselves. Hence, a source of financial support is crucial to continued attendance in the program. The source of financial support for Women in Science may be seen in Table 13. As is clearly seen, husband's income was the source of income for ten of seventeen of the women. Other sources of financial support were part-

TABLE 10. PROFILE OF WOMEN IN SCIENCE

I. COLLEGE MAJORS AND MINORS

MAJOR IN COLLEGE	FREQUENCY
BIOLOGY	7
CHEMISTRY	5
MATHEMATICS	1
OTHER (SPECIFY)	
MEDICAL TECHNOLOGY	1
HOME ECONOMICS	1
ANIMAL SCIENCES	1
PHARMACY	1
PSYCHOLOGY	1
COMPREHENSIVE SCIENCE	1
MICROBIOLOGY	1
TOTAL	20

MINORS IN COLLEGE	FREQUENCY
BIOLOGY	3
CHEMISTRY	4
MATHEMATICS	3
PHYSICS	1
OTHER (SPECIFY)	
FRENCH	1
TOTAL	12

ONLY MATHEMATICS MAJOR HAS NO CHEMISTRY COURSES ON TRANSCRIPT.

TABLE 12. PROFILE OF WOMEN IN SCIENCE

III. REASONS FOR CAREER INACTIVITY IN SCIENCE

1. "NOT BEING QUALIFIED TO COACH ATHLETICS"
2. "LACK OF CONFIDENCE AFTER BEING INACTIVE IN THE FIELD"
3. "GOT MARRIED AND STAYED HOME WITH THE CHILDREN"
4. "LIVED IN SMALL CITIES WITH FEW AVAILABLE JOBS"
5. "EXPAND INTO OTHER AREAS OF SCIENCE"
6. "VERY GENERAL SCIENCE BACKGROUND"
7. "LACK OF KNOWLEDGE OF WHAT CAREERS WERE AVAILABLE TO ME"
8. "FEAR OF HAVING FORGOTTEN MOST OF WHAT I KNEW"
9. "SALARIES NOT INTERESTING ENOUGH TO UPDATE CAREER"
10. "LACK OF AVAILABLE JOBS AT PROPER TIME"

TABLE 13. PROFILE OF WOMEN IN SCIENCE

IV. SOURCE OF FINANCIAL SUPPORT DURING PARTICIPATION IN PROGRAM

SOURCE OF FINANCIAL SUPPORT	FREQUENCY
1. HUSBAND'S INCOME	10
2. SUPPORT FROM EX-HUSBAND	1
3. FAMILY AND SAVINGS	2
4. AID TO DEPENDENT CHILDREN	1
5. HUSBAND'S SALARY AND TEACHING ONE NIGHT CLASS PER WEEK	1
6. WORK (2 DAYS ON WEEK-ENDS)	1
7. PART-TIME JOB	1
TOTAL	17

time jobs, at nights or on weekends, family and savings, and aid to dependent children. Three to four women found jobs on the campus as student workers.

THE SIUE CAREER FACILITATION PROGRAM

Sixteen women of diverse scientific backgrounds are taking a continuing education program of forty-five credit, tuition-free courses. The women are registered in the University as unclassified students in the graduate school. All courses except food and flavor chemistry are taught by regular university faculty. An employee of Anheuser-Busch, Inc. will be intimately involved in the food and flavor chemistry courses.

The first day of the program was an orientation day for women participants to meet the faculty and become familiar with the University. The following courses and activities are available to Women in Science Career Facilitation Participants.

1. Chemistry Colloquium I - Basic Concepts in Chemistry - 4 credits.
   A general background in chemistry is presented. A body of chemical principles is presented with emphasis on the existence, size, structure, and bonding of atoms. The course will be presented in four lecture hours each week for ten weeks in the Fall Quarter of 1977. It is taught by Dr. Stephen K. Hall.
2. Chemistry Colloquium II - Physical Chemistry - 5 credits.
   Traditional and biological aspects of physical chemistry are presented. Some of the biological topics covered are physical chemistry of such biomolecules as proteins, nucleic acids and enzymes. The laboratory covers physical methods of measurement including spectroscopy. The course includes four lectures and one three-hour laboratory each week for ten weeks in Winter Quarter of 1978. Team taught by Dr. John A. Spencer, Dr. Annette Baich and Dr. Michael E. Landis.

3. Chemistry Colloquium III - Environmental Science - 4 credits.

   This is an interdisciplinary course which presents the fundamental principles of environmental problems. A balance of contributions from the several physical and biological disciplines is presented. Some of the topics include meteorology, climatology, industrial emissions, and water and thermal pollution. The course consists of four lectures each week for ten weeks in the Winter Quarter of 1978. Dr. Stephen K. Hall, Associate Professor of Chemistry presents this course.

4. Chemical Colloquium IV - The Industrial Environment - 4 credits.

   This course is intended for individuals with limited experience in an industrial environment. It is designed to raise the individual's awareness of the industrial environment, the effects of excessive exposure on the worker, and the basic types of hazard control. Four lecture-demonstration hours per week. Dr. S.K. Hall will present this course during Spring Quarter, 1978.

5. Chemistry Colloquium V - Flavor Chemistry - 3 credits.

   This course covers the chemistry and biology of processes which lead to changes in flavor, texture, or color in food and beverages. Some of the topics covered are physiology and chemistry of odor and taste perception, theories of olfaction and gustation, the relationship between chemical structure and flavor, chemistry of flavors and fragrances, flavors of foods and beverages, sensory evaluation and measurement, and flavor formulation and control. The course is presented in Spring Quarter, 1978. The course is developed and presented by Dr. S. Rao Palamand of Anheuser-Busch and Adjunct Associate Professor of Chemistry.

6. Chemistry Colloquium VI - Food Chemistry and Analysis - 4 credits.

   The composition, structure, and properties of food and beverages and the

chemical and physical changes which occur during processing and use are covered in three lectures and one three-hour laboratory period each week for ten weeks during the Spring Quarter of 1978. This course is a team effort by Dr. Charlotte O. Lee, Associate Professor of Chemistry, Dr. F.H. Firsching, Professor of Chemistry, and Dr. S. Rao Palamand of Anheuser-Busch and Adjunct Associate Professor of Chemistry. Field trips to local food industries will be included in this course.

7. Chemistry Colloquium VII - Selected Topics - 2 credits.
   Independent study includes selected readings in physical chemistry, analytical chemistry, environmental sciences, biochemistry, or food chemistry. Students select one area of chemistry for in-depth intensive study. The class meetings are to be arranged with the instructor during Fall, Winter, or Spring Quarters, 1977-1978. Instructors for independent study are Drs. F.H. Firsching, S.K. Hall, J.A. Spencer, M.E. Landis, A. Baich, C.O. Lee, M. Livingston, S.R. Palamand, and T.D. Bouman.
8. Chemical Colloquium VIII - Chemical Problems - 3 credits.
   This course involves an investigation of a specific chemical problem under the direction of a project instructor. Areas of study are biochemistry, environmental science, food enzymes, physical chemistry, analytical chemistry, and flavor chemistry. Instructors for Chemical Problems are Baich, Firsching, Landis, Hall, Spencer, Lee, Livingston, and Palamand. Class meetings and conferences will be arranged with an instructor during the Spring Quarter of 1978. The problem selection and identification begun by means of independent study in the Selected Topics Course is continued by an investigation of the problem. A written technical report to cover work begun in Colloquium VII and finished by Colloquium VIII is required.
9. Chemical Colloquium IX - Mathematics for Chemists - a,b,c, 4 credits each

quarter.

a. This course includes an overview and review of the differential and integral calculus of one variable; it includes discussion of problems of special interest to chemists and biologists. The course meets four hours each week for ten weeks during Fall Quarter, 1977.

b. This course involves an introduction to programming in Fortran IV. Topics covered include debugging, the use of flow charts, and the use of program packages. Emphasis on computer applications to problems in chemistry and biology. Four lecture hours per week for ten weeks during Winter Quarter of 1978.

c. Introduction to statistical methods including estimation and testing of hypotheses, analysis of variance, and design of experiments. Use will be made of the computer experience gained in b. Four lecture hours per week for ten weeks during Spring Quarter, 1978. Dr. Marilyn Livingston, Associate Professor of Mathematical Studies will develop and present this course for Science Career Facilitation Project Participants.

Additional non-science courses and activities follow:

1. Technical Report Writing for the Mature Scientist - 4 credits.

Designed for the mature scientist, the course involves principles of technical writing with emphasis on organization, style, grammar and usage. Participants gain practice in writing technical reports, instructions, outlines, and summaries. Special instructions emphasize library procedures and writing a chemical research paper. The course is divided as follows: First two weeks is a review of basic composition and grammar. The third through the sixth week deals with general organization, styles, and usage in technical papers. The last four weeks are concerned with the investigation of functional models and the production of a technical chemical report.

Dr. Jane Pennell will develop and present this course which will meet four times a week for ten weeks in the Fall Quarter of 1977. Participants in need of extra assistance in writing are referred to the Writing Clinic. The Writing Clinic offers assistance in writing papers, reports, or theses to any student. Self-instruction materials in organization, paragraphing, term paper writing, grammar, spelling and vocabulary building are also available. No enrollment or appointment is necessary for assistance in the Writing Clinic.

2. Personal, Career, and Job Placement Counseling for Women Scientists

The initial interest inventory is the Self-Directed Search by Holland (14). This inventory is a part of the participant selection materials. Another self-guidance instrument, Planning for Work, is used during the initial phases of the educational Program (15).

Women Chemists and Biologists, especially those who have been inactive, will use career development materials such as films in self-study and group counseling activities. These women will obtain current information on their major areas of interest, on labor trends, on training requirements and on specific work requirements for employment opportunities. The career counselor will conduct seminars in how to write a resumé. Staged job interviews will be video taped with the women participants playing roles of interviewers and interviewees. Personal counseling will be scheduled for individual participants. The time will be one hour per participant per week.

3. Chemical Seminars

Scientists who are graduates of SIUE and are currently employed in local job markets will be visiting lectures for both the counseling activities and as seminar speakers on their scientific work. Other seminar speakers

TABLE 14. THE SOUTHERN ILLINOIS UNIVERSITY
WOMEN IN SCIENCE PROGRAM

COURSE SCHEDULES

FALL QUARTER		WINTER QUARTER		SPRING QUARTER	
COURSE TITLE	CREDITS	COURSE TITLE	CREDITS	COURSE TITLE	CREDITS
1. BASIC CONCEPTS OF CHEMISTRY	4	1. PHYSICAL CHEMISTRY INCLUDING LAB	5	1. FLAVOR CHEMISTRY	3
2. MATHEMATICS FOR CHEMISTS-ANALYSIS	4	2. MATHEMATICS FOR CHEMISTS-COMPUTER SCIENCE	4	2. MATHEMATICS FOR CHEMISTS-STATISTICAL	4
3. TECHNICAL WRITING FOR MATURE SCIENTISTS	4	3. ENVIRONMENTAL SCIENCE	4	3. FOOD CHEMISTRY AND ANALYSIS INCLUDING LABORATORY	4
4. COUNSELING	0	4. DEVELOPMENTAL READING/COUNSELING	1	4. THE INDUSTRIAL ENVIRONMENT (HYGIENE)	4
5. CHEMISTRY SEMINARS	0	5. CHEMISTRY SEMINARS	0	5. CAREER COUNSELING, FIELD TRIPS	0
6. CHEMICAL PROBLEMS/ INDEPENDENT STUDY (VARIABLE CREDIT OPTIONAL)	1-3	6. CHEMICAL PROBLEMS/ INDEPENDENT STUDY (VARIABLE CREDIT OPTIONAL)	1-3	6. CHEMICAL PROBLEMS/ INDEPENDENT STUDY (VARIABLE CREDIT OPTIONAL)	1-3
TUTORIALS	0	TUTORIALS	0	TUTORIALS	0
MINIMUM TOTAL HOURS	12	MINIMUM TOTAL HOURS	14	MINIMUM TOTAL HOURS	15

will include practicing professional women. Informal pre-seminar meetings are arranged for the Women in Science Participants prior to the formal seminar presentations.

The course schedules for the program are presented in Table 14. At this time the women are about 4½ months into the program. The Fall Quarter courses which have been completed are listed in the first column. Courses in computer science, developmental reading (speed reading), physical chemistry lecture and laboratory, and environmental science for a total of fourteen hours are taken Winter Quarter. Food and flavor chemistry courses, field trips, industrial hygiene, statistics, and research will be available during Spring Quarter.

Textbooks used by Women in Science Participants in their respective courses follow:

1. Technical Writing - No text.
2. Basic Concepts of Chemistry

   "Introduction to Modern Inorganic Chemistry", by K.M. Mackay and R. Ann Mackay. Second edition, Inter Text Books. London, 1973.
3. Mathematics for Chemists - Analysis (Calculus)

   "Calculus and Its Applications", by L.J. Goldstein, D.C. Lay, and D.I. Schneider.- Prentice Hall. Englewood Cliffs, N.J. 1977.

Winter Quarter

1. Environmental Science

   "Environmental Chemistry", by Moore and Moore. Harper and Rowe.
2. Mathematics for Chemists - Computer Science

   "Problem Solving and Structural Programming in Fortran", by F.L. Friedman and E.S. Koffman. Edison Wesley, 1977.
3. Physical Chemistry

   "Physical Chemistry for Life Sciences", by G.M. Barrow. McGraw-Hill, 1974.

"Experiments in Physical Chemistry", by D.P. Shoemaker, C.W. Curland, and J.I. Steinfeld. Third edition, McGraw-Hill. St. Louis, 1974.

Spring Quarter

1. Food Chemistry and Analysis

   "Basic Food Chemistry - Lecture", by F.A. Lee. Avi Publishing Co., Westport, Conn., 1975.

2. The Industrial Environment - Av. Topics in Biochemistry

   "Industrial Health", by J.E. Peterson. Prentice-Hall, Inc. Englewood Cliffs, N.J.,

3. Flavor Chemistry - No Text.

4. Statistics and Probability - No text selected as yet.

EVALUATION OF PROGRAM

Formative evaluation is an integral part of the program. Women in need of additional background information are provided with tutorial assistance on a continuing basis. The women's progress in the program is evaluated as follows:

1. Test and examination grades are used to determine participant competence. Women will be considered to be gaining or re-gaining skills if more than fifty percent make scores of seventy-five or better on examinations.
2. Regular attendance in classes and at scheduled activities is expected. Irregular or sporadic attendance at scheduled activities will require immediate counseling action to determine the source of the problem and, if possible, to assist in its solution.
3. Arrangements will be made for participants to take the Graduate Record Examination (GRE) and Standardized American Chemical Society (ACS) Test. Their scores on these tests will determine readiness to enter graduate school and competence as a chemist.

4. Self-evaluations by the participants of their performance and expectations will be performed at various intervals during the program's operational phase. The purpose of these evaluations is to develop a rapport between the participants, faculty, and staff.

Effectiveness of the instructional procedures will be evaluated as follows:

1. Grades obtained by participants will be used to judge adequacy of instruction.
2. The counseling program will also provide continuous evaluations of the program's effect on the participants. The model for evaluation of counseling is based upon the model developed for the Career Education for Mature Women Program developed by our University (13). This model involves participant questionnaires and anecdotal summaries of each woman's progress.
3. The number of participants who enter graduate work in chemistry after completion of the Chemistry Colloquium series and their scores on the GRE will be used as criteria for evaluating the specially designed courses including technical writing.
4. Records will be kept of the number of participants assisted to enter graduate schools. Important activities include number of students assisted in writing resumés, the number of letters of recommendation mailed to graduate schools and prospective employers for each participant, and the number of Science Career Facilitation Project Participants admitted who applied for and received admission to the Graduate School at Southern Illinois University at Edwardsville.

Contact will be made by the Counseling and Placement Services with prospective employers and employment interview dates will be scheduled for project participants. Personnel officers from local industries will be invited as guest seminar speakers. Participants will also take field

trips to local industries to become acquainted with industrial procedures.

At least one Science Career Facilitation Project Participant will be offered financial assistance by the Department of Chemistry to pursue a Master's degree in Chemistry.

Science Career Facilitation Project Participants can be admitted to the University under special student status in the Graduate School.

5. The number of participants employed in local food manufacturing industries will be taken as a measure of the effectiveness of the food chemistry courses as career transition models.
6. The number of participants employed as environmental technicians in local industries will measure the effectiveness of the industrial health and environmental science courses as career transition models.

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SUMMARY

The Science Career Facilitation Project is an Experimental Continuing Education Program for Mature Women Scientists which is supported by the National Science Foundation. The purpose of the Project is to design an educational experience which will refresh and update the scientific skills of women whose terminal degree in science was received from two to fifteen years ago. Programs to upgrade the status of Women in Science are still needed because employment of women, including minority women, in scientific careers has not changed appreciably over the last decade. The major means of contact with prospective women participants was by means of large display advertisements in local papers. Participants in the program are primarily biologists whose current occupation is homemaking and whose chief source of financial support are their husband's income. The Continuing Education Program for Mature Women Scientists emphasizes those skills which are likely to be lost by disuse, as well as professional re-training in specific areas of chemistry and mathematics. The program consists of a year-long course in mathematics for chemists, a one-quarter course in technical writing and six courses in various areas of chemistry.

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FOOTNOTES

1. Author to whom all correspondence should be addressed.

2. Some of the data included in this manuscript were presented in poster sessions at '13th Mid Western Regional Meeting of American Chemical Society, November 3, 1977 and before the Division of Chemical Education at 175th Annual Meeting of the American Chemical Society, March 13, 1978.